

### **REMARKS**

The Office Action dated January 15, 2004, has been received and carefully noted. The amendments made herein and the following remarks are submitted as a full and complete response thereto.

Claims 1 and 3 have been amended. Applicants submit that the amendments made herein are fully supported in the specification and the drawings as originally filed, and therefore no new matter has been added. Accordingly, claims 1, 3, 4, and 8 are pending in the present application and are respectfully submitted for consideration.

Claims 1, 3 and 4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Conrad (U.S. Patent No. 5,211,919, "Conrad"). In addition, claims 1, 3 and 4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamiya et al. (U.S. Patent No. 5,549,874, "Kamiya"). Claims 1, 3 and 4 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Duarte (U.S. Patent No. 5,554,344) in view of Kamiya, and claims 1, 3, 4, and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kieser et al. (U.S. Patent No. 5,746,051, "Kieser"). Lastly, claim 8 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Conrad, Kamiya or Kuarte as modified by Kamiya and further in view of Kieser.

Applicants respectfully submit that each of claims 1, 3, 4 and 8 recites subject matter that is neither disclosed nor suggested by the cited prior art.

Claim 1, as amended recites a plasma reactor having an electrical power supply for applying an alternating or pulsed current, and a generating means for generating a

plasma from a gas, the plasma having an average current density  $I_{rd}$  satisfying the formula of  $10^{-4} \text{ A/cm}^2 \leq I_{rd} \leq 10^{-1} \text{ A/cm}^2$ .

Accordingly, at least one of the essential features of the present invention is "a generating means for generating a plasma from a gas, the plasma having an average current density  $I_{rd}$  satisfying the formula of  $10^{-4} \text{ A/cm}^2 \leq I_{rd} \leq 10^{-1} \text{ A/cm}^2$ ." As such, the present invention results in the advantage of providing a plasma reactor which does not require a high power supply voltage and can form a plasma with a necessary and sufficient average current density over the whole region between a pair of electrodes thereby efficiently modifying a gas.

It is respectfully submitted that the prior art fails to disclose or suggest the elements of the Applicants' invention as set forth in claims 1, 3, 4 and 8, and therefore fails to provide the advantages that are provided by the present application.

As a preliminary matter, Applicants incorporate herein the rebuttal arguments as set forth in the previous responses, and supplements with the following rebuttal arguments.

Conrad discloses a flat plate corona cell for generating ozone with a generally convergent radial gas flow. The net gas flow direction through the corona gap of Conrad is from the outer edges of the cell inward towards an exit port in the approximate center of the cell, therefore eliminating parasitic arcing at the perimeter, greatly increases the life of the perimeter seal, and provides a homogenous gas flow which increases ozone output. The cell design of Conrad allows both electrodes to be operated at high voltage, therefore reducing the effective kilovolts with respect to ground by half.

Kamiya discloses a discharge reactor that generates silent discharge and/or creeping discharge between dielectric and high voltage electrode and/or grounded electrode, the dielectric being located between high voltage electrode and grounded electrode, and which generates clean ozone in the discharge space 1 as it passes through said discharge space 1 or as it is held within said discharge space 1, which discharge reactor is characterized in that the dielectric is made of highly purified quartz glass ( $\text{SiO}_2$ ) or single-crystal sapphire which is a highly purified crystallized aluminium oxide or high-purity alumina ceramics which is the firing of highly purified aluminum oxide.

Duarte discloses a gas ionization device also referred to as a corona discharge type of ozone generator. Duarte discloses an inner and outer concentric metal electrode and ground plane with a glass dielectric tube disposed between them. Gas is passed between the dielectric and the ground plane for the purpose of producing concentrations of ozone. The electrode as well as the ground plane of Duarte are designed to permit cooling of the ozone producing chamber. An electro-static field enhancing technique effectively produces a significant greater amount of ozone as a result.

Kieser discloses discharge paths bordering on a single metallic electrode surface or layer and provides electric power that is supplied from two different sides with the metallic layers having alternating polarities.

Applicants respectfully submit that each and every element recited within claim 1 is neither disclosed nor suggested by Conrad, Kamiya, Duarte and Kieser, taken alone

or in combination. In particular, Applicants submit that the plasma reactor as recited in the present application is clearly distinct from that which is illustrated by the combination of the cited prior art. Specifically, it is submitted that the cited prior art fails to disclose or suggest “a generating means for generating a plasma from a gas, the plasma having an average current density  $I_{rd}$  satisfying the formula of  $10^{-4} \text{ A/cm}^2 \leq I_{rd} \leq 10^{-1} \text{ A/cm}^2$ .”

As mentioned above, Conrad merely discloses a flat plate corona cell for generating ozone, and Kamiya only discloses a discharge reactor yet both of the cited art fail to disclose or suggest a generating means as recited in claim 1. In addition, Duarte only discloses a gas ionization device, and Kieser simply shows a device for detoxifying exhaust fumes, but the cited prior art also does not teach or disclose a generating means for generating a plasma from a gas, the plasma having an average current density  $I_{rd}$  satisfying the formula of  $10^{-4} \text{ A/cm}^2 \leq I_{rd} \leq 10^{-1} \text{ A/cm}^2$  as recited in claim 1 of the present application.

Accordingly, Applicants respectfully submit that neither Conrad, Kamiya, Duarte nor Kieser, taken alone or in combination, discloses each and every element recited in claim 1 of the present application, and therefore is allowable.

As claims 3, 4 and 8 depend from claim 1, Applicants submit that each of these claims incorporates the patentable aspects therein, and are therefore allowable for at least the reasons set forth above with respect to independent claim 1.

In view of the above, Applicants respectfully submit that each of claims 1, 3, 4 and 8 recites subject matter that is neither disclosed nor suggested in the cited prior art. Applicants also submit that the subject matter is more than sufficient to render the

claims non-obvious to a person of ordinary skill in the art, and therefore respectfully request that claims 1, 3, 4, and 8 be found allowable and that this application be passed to issue.

If for any reason, the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper has not been timely filed, the Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300 referencing Attorney Docket No. 107348-00102.

Respectfully submitted,



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